

**Abstract**

We present a quantitative analysis of the composition (commercialized catch and corresponding discard) of trawl catches, in seven ports of the western Mediterranean. Discards are defined here as the fraction of the catch from the haul that is returned to the sea by the fishermen, because it does not have commercial value. A sampling programme on board commercial was performed from June 1995 to June 1996. The hauls were sampled for the collection of the total catch in weight, by species, for the commercial and discarded fractions separately. The factors of stratification considered were in all the ports, depth, with three strata, stratum A (<150 m), B (between 150-300 m) and C (>350 m), to which factor for two types of gear in the Porto Santo Stefano or two classes of vessel power in Vilanova were added. The results obtained have allowed to characterize the commercial and discards fractions. The discarded biomass always constituted an important fraction of the total catch. However, the discard of species with high commercial interest was very low or nil.

*Key-words* : fisheries, biomass, western Mediterranean

**Introduction**

In the fisheries management, some technical measures (1, 2) such as those of mesh regulation in order to reduce the catches of smaller sizes, are widely accepted (3). However, the effects and repercussions of the discards caused by fishing, such as, economic losses (losses of future catches), or ecological impacts (in terms of protection of resources and environment) remain largely unknown and constitute a problem faced by management, evaluation in the long term and regulation of fisheries in the whole world (4, 5) that is on the other hand necessary to approach. A recent review on the state of the discards at a world level, carried out by Alverson *et al.* (6), provisionally estimates global fish discards of around 27 million tonnes which gives an idea of the importance that such practices represent. This same study makes clear that there is a shortage of information on the Mediterranean. In the western Mediterranean the demersal fishery is one of the most important, as much for the volume of its catches (biomass) as for the economic value it attains. The trawl fishery shows the phenomena of commercial species discards. The present work is included in a research project financed by the European Community about the discards of the trawl fishery in the western Mediterranean (Study n°94/027). Discards are defined as that fraction of the catch from the haul that is returned to the sea because it does not have commercial value, which are fishes, crustaceans cephalops or other invertebrates such as equinoderms, gastropods, bivalves, sponges, etc., as well as the vegetal fraction (algae and phanerogams). The aim of this study is to show the differences observed in the practice of discards in seven ports of the western Mediterranean, considering two fractions in the total catch : commercialized and discarded.

**Material and methods**

Seven fishing ports were selected in the study area Porto Santo Stefano (Italy), Vilanova i la Geltru, Valencia, Santa Pola, Fuengirola, Palma and Alcudia (Spain). The sampling programme was carried out from June 1995 to June 1996, by observers on board commercial fishing vessel during normal fishing activity. In all areas three depth strata were defined as stratum A <150 m depth, stratum B between 151-350 m and stratum C >350 m deep. In Porto Santo Stefano the

fleet was subdivided into two categories, identified as those vessels equipped with the traditional trawl nets and those working with wide opening ("French") trawl nets. In the port of Vilanova i la Geltru the fleet was subdivided into two categories depending on the power, less than 150 hp vessels and greater than 150 hp. The sampling unit was the haul. A total 458 hauls were samples.

For each haul, date, position, duration, depth and course were noted. The weight of the commercialised and discarded catch was estimated by species using dynamometers. The catch of the total, commercial and discarded fractions by haul was standardized to hourly yields (kg/h). The total mean annual yields of both fractions were obtained by an average of the standardized hourly yields, and its standard deviations. As well as were calculated the relative proportion of commercialised species and discarded species and discards to the total catch by each port, stratum, gear type or horse power of the boats.

**Results**

The sampling effort, 1463 fishing hours in total, was distributed as follows : 218 hauls in stratum A, 136 in stratum B, and 104 in C. A total of 609 species were identified. The most frequently represented groups were fish, with 239 species, molluscs with 137, and crustaceans with 101. The mean annual values of total catch and its standard deviation are shown in Table 1 by each port, stratum, and of the gear type or horse power of the vessels. Figures 2, 3 and 4 represent the relative proportion corresponding to the commercial and discard fractions.

Table 1. Mean annual hourly yields (kg/h) of the total catch and its standard deviation.

	Stratum A		Stratum B		Stratum C	
	Mean	STD	Mean	STD	Mean	STD
Fuengirola	61.78	21.60	39.91	9.95	29.62	11.85
Santa Pola	44.49	56.32	146.83	213.17	17.39	12.20
Valencia	49.14	24.32	91.57	66.30	36.38	19.58
Palma	179.56	148.21	104.29	122.16	23.59	12.63
Alcúdia	120.36	72.40	118.78	113.79	14.61	7.75
Pisa w.o.t	37.28	22.84				
Pisa Traditional	26.32	6.56	39.16	20.19	23.49	12.96
Vilanova<150 hp	72.51	115.21	15.09	7.20	11.75	5.19
Vilanova>150 hp	50.01	29.05	134.61	162.51	25.87	13.14

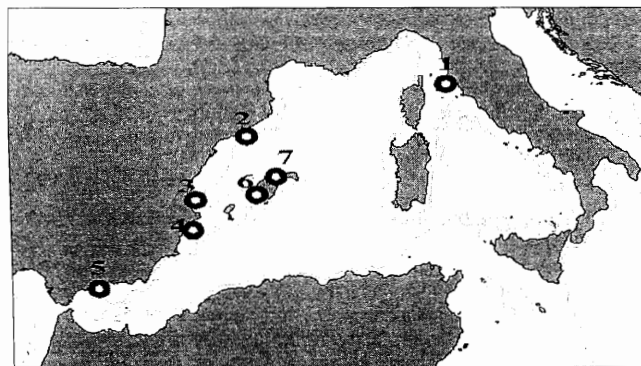


Figure 1. Study Area. Location of sampling ports : 1= Porto Santo Stefano, 2= Vilanova i la Geltru, 3= Valencia, 4= Santa Pola, 5= Fuengirola, 6= Palma, 7= Alcudia port.

Stratum A, the most coastal, was characterized by important catches of fish such as *Mullus barbatus*, *M. surmuletus*, *Merluccius merluccius*, and in minor quantities, among others, Sparidae, Trachinidae, Scorpaenidae, Triglidae, Soleidae, Scylliorhinidae and Rajidae species, and cephalopods such as *Octopus vulgaris* and *Eledone cirrhosa*. All of them have a large commercial importance and in general their discard is practically nil. In this stratum the discard showed two situations : in the ports of Palma and Alcudia the discard of invertebrates and flora was very much higher than for fish (up to 67% in Palma de Mallorca, due fundamentally to rhodophytic algae), whereas in the other ports fish constituted the most important fraction of the discard, with some species such as *Boops boops* and *Sardina pilchardus* being important.

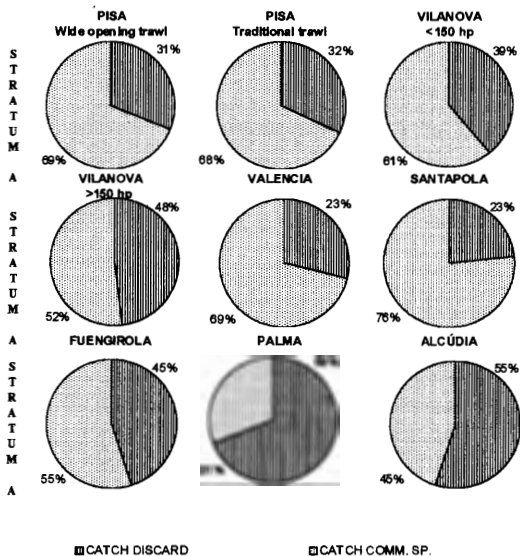


Fig. 2. Mean annual catch composition expressed in percentages of the total yields. Stratum A. stratum B recorded important catches of *M. merluccius*, *Micromesistius putassou*, *E. cirrosa* among the cephalopods, and *Nephrops norvegicus* among the crustaceans. Depending on the ports other commercial species such as *Parapenaeus longirostris*, *Lophius* spp., *Trisopterus minutus capelanus* and *Zeus faber* were also important. Fish represented the most important fraction in the discard of this stratum, mainly specimens of small size of species such as *M. putassou*, *M. merluccius* and *T. minutus capelanus* or low commercial value such as *B. boops*, *Lepidopus caudatus*, *Argentina sphyraena*, among others.

### Conclusions

The catches, markedly multispecific, presented a large variability in yields among the study ports. The commercialized fraction represented in all cases the most important part of the total biomass caught. The discard of species with high commercial value was very low or nil. The discarded biomass always constituted an important fraction of the total catch and affected principally species of nil or little commercial interest. Discards were higher on the shelf.

The mean annual values of the percentage of the total catch discarded in the seven ports showed differences among depth strata. In stratum A around 40% of the total catch was discarded in average, values rang between 23 to 67%. In stratum B average of 35% of the total catch was discarded, mainly fish, values ranged between 13 to 62%. In stratum C the mean discard was 27% and corresponded principally to species without commercial interest or to small sized commercial species; discards oscillated between 14 to 43% of the total catch. In P. Sto Stefano, the vessels using the French trawl mainly operated in stratum A obtaining larger catches. In Vilanova i la Geltru the less powerful vessels mainly operated in stratum A, and only fished in B and sporadically in C at certain times of the year. The hourly yields of the

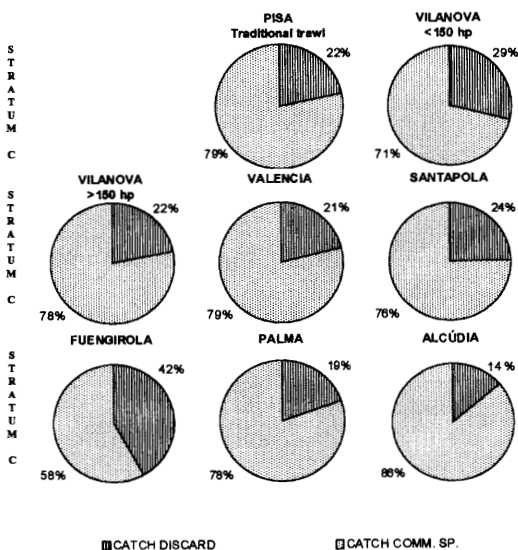


Fig. 4. Mean annual catch composition expressed in percentages of the total yields. Stratum C.

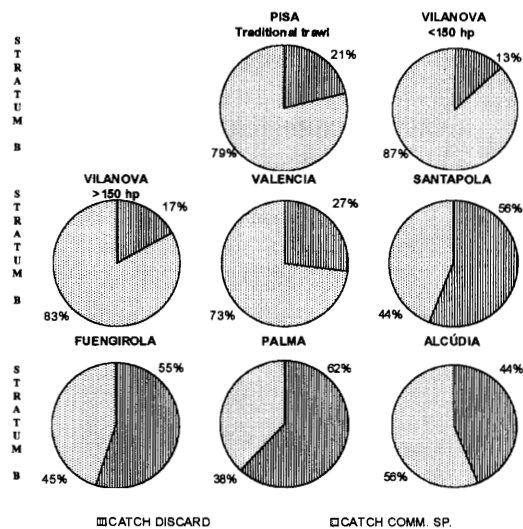


Fig. 3. Mean annual catch composition expressed in percentages of the total yields. Stratum B. Stratum C was characterized by the catch of decapod crustaceans such as *N. norvegicus*, *Aristeus antennatus*, *Plesionika* spp., *Geryon longipes* and *Macropipus tuberculatus*. Among the fish, some gadids as *Phycis blennoides* and *M. merluccius* of large size were important. In this stratum the discard corresponds to species without any commercial interest (families Myctophidae, Macruridae, some crustaceans) and small specimens of *Galeus melastomus* and *P. blennoides*.

>150 hp vessels were not always greater than those obtained by the <150 hp vessels. In general our pattern of discards is similar to other recent studies (7) carried out, both in the Mediterranean and in the Atlantic (8). There are several factors which can effect the discards, among the more important in these study were the port (geographic situation and geomorphologic characteristics), and the depth. Other factor that could produce discards was the low selling price in the fish market. Finally, it is emphasized that the present study is the first focused on the discards in the western Mediterranean.

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